INFORMATIONAL REPORT ON THE RISK OF TRANSMISSION OF BRUCELLOSIS FROM INFECTED BULL BISON TO CATTLE

This report was prepared at the request of the:
Greater Yellowstone Interagency Brucellosis Committee
by an Interagency Task Group:

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I. BACKGROUND

Bison in Yellowstone National Park and Grand Teton National Park are known to harbor the *Brucella abortus* organism. Although the testing program for this disease has been somewhat sporadic, a significant number of reactors has been regularly reported since the initial discovery in 1917. These seropositive animals are not considered a problem in the breeding biology of the bison herd. However, they are considered a possible source of brucellosis for cattle when they cross the Park boundaries. Emigrating bison require consideration if there is any potential for transmission of brucellosis to domestic cattle. The normal transmission mode involves direct contact with tissues or discharges from female animals that have aborted. The danger of transmission by bulls is clearly less than the danger of transmission by bison cows, but the level of that danger has not been specifically determined.

II. PROBLEM DEFINITION

The proportion of bull bison testing seropositive for *B. abortus* in Yellowstone National Park has ranged from 4 percent to 90 percent since testing began in the early 1930s. In the most recently reported sample, 46 percent of 120 adult bulls tested seropositive (Meyer and Meagher 1994). However, there has never been a consistent testing program within the Park, and it is not clear that all serologic tests are reliable when used on bison sera. The literature describing brucellosis test results repeatedly warns that seropositive percentages always exceed culture percentages. In the 1991-1992 samples from Yellowstone, 240 bison were serotested and 218 were bacteriologically cultured. Of these, 37 percent produced a serotest response but only 12 percent of these cultured positives.

There are many possible reasons for the high percentage of seropositive- compared to culture-positive bison. Tissue samples too small, number of tissues too few, loss of viability during storage or transport, or even the possibility that bison do not respond in the same way as cattle to the standard tests. The important point, however, is that bison leaving Yellowstone Park often do test positive. Moreover, the results of testing suggest that bison bulls are more likely to test positive than bison cows.

III. TRANSMISSION OF BRUCELLOSIS

Brucellosis is typically transmitted when susceptible animals come into direct contact with tissues or discharges from infected animals. Infection generally results from the ingestion of contaminated material. In cattle, infected cows usually abort during the first pregnancy after infection. Thereafter, the disease usually localizes in the lymph nodes surrounding the reproductive organs and the udder. Bacteria are shed in milk, birth membranes and discharges from the female reproductive tract after birth or abortion. Transmission from bull bison to cattle, if it occurs at all, must obviously take a somewhat different tract. Theoretically, if the organism is present in the reproductive system, a bull might transmit during breeding or attempted breeding, or even through a non-breeding discharge that is picked up by another animal in licking or feeding.

Venereal Transmission

Generally, the bull is not credited with playing a significant role in brucellosis of cattle. A very substantial amount of research has been conducted in attempting to determine transmission rates by infected bulls to heifers or cows during breeding. Reports of these experiments range in time from 1926 (Lubbehusin and Fitch), 1938 (Jepson and Jorgenson) through the 1940s (Thomsen 1943; Bendixen and Blom 1947; King 1940), l9SOs (Manthei, et al. 1950), and 1960s (Mukerji 1960; Rankin 1965), and although the numbers of animals reported is relatively small in each of these studies, there is not one reported incident of brucellosis transmission through normal coitus by an infected bull.

Transmission via artificial insemination, on the other hand, has been reported to occur with relative certainty (Bendixen and Blom 1947; Manthei et al. 1950; Rankin 1965). Apparently, inoculation of contaminated semen directly to the uterus produces an environment in which *B. abortus* grows, as compared to the vaginal environment in which the organisms die.

Only one study of potential transmission of brucellosis by bison bulls has been reported, and it involved very few animals (Robinson, et al. 1994). The results are consistent with previous studies in that normal service by one infected bull did not transmit brucellosis to the cow or to subsequent calves. The authors, however, report no transmission during artificial insemination. They also note that shedding of *Brucella* bacteria in the semen of bison is extremely rare.

Environmental Contamination

Mukerji (1960) proposed that discharges from an infected bull may contaminate pastures, food, or udder and potentially lead to infection of other animals through the alimentary tract. While this view has been mentioned by other authors as well, there is no confirmed report of infection following contamination of food or water by a bull in either cattle or bison.

IV. CONCLUSION

The available evidence indicates that any risk of *Brucella abortus* transmission from bison to cattle is almost certainly confined to contamination by a birth event by adult females. However, limited data exist documenting the presence of Brucella abortus organisms in bison semen, therefore, the risk of transmission from bull bison, though logically small, cannot be entirely eliminated based on existing information.

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